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Microelectrode, preferably for pH-Measurement

The invention relates to a microelectrode, preferably for pH-measurement in human and animal tissues.

The measurement of pH in biological materials is part of clinical diagnostics and can, as known in the art, involve the performance of measurements on blood and other body fluids outside the body, using glass electrodes, or in the larger body cavities, e.g. in the stomach, using sensors. For certain investigations, it is necessary to perform pH-measurements in living tissue, the bloodstream, or the heart. However, glass electrodes cannot be used for this purpose, because they are liable to break.

Larger bismuth electrodes and antimony electrodes are also known in the art, but because of their size they are not suitable for use on the human body and are only utilized to a limited extent for laboratory samples.

Because of such drawbacks, the fluid to be measured must always be removed from the overall system, and therefore rapid measurement and continuous monitoring over a longer period of time are not possible. Moreover, not all regions of interest can be dealt with.

The aim of the invention is to create a microelectrode that is free from the shortcomings of the state of the art and, more particularly, to create a microelectrode, preferably for pH-measurement, which can be used without danger in human tissue or the human bloodstream and is suitable for continuous measurement; it should also be able to be inserted in a catheter, so as to be able to perform measurements in the heart for example.

This aim is achieved by the invention in that a coating suitable for the measuring task concerned is applied to a short region on the beginning-end of a molybdenum wire. In the case of pH-measurement, this coating consists of a mixture of very finely ground bismuth powder and a conductive lacquer. If, for example, the ion concentration in the tissue is to be measured, then a suitable ion-sensitive substance is mixed into the lacquer. The uncoated part of the molybdenum wire is electrically insulated. A favourable embodiment of the microelectrode is one in which the molybdenum wire is etched to a point at the end, so that this can be used as an insertion-microelectrode. It is also possible to use plastic instead of the molybdenum wire, applying a conductive silver strip — or covering the plastic all over with a conductive silver layer — to lead the voltage off. Such a conductive silver layer then has to insulated electrically on the surface.

When using a molybdenum wire, it is also of advantage to apply, to the insulation thereon, a conductive silver layer, which itself is then insulated on the surface, to serve as a reference electrode; otherwise a separate reference electrode has to be applied to the body.

The benefits of the invention lie in the fact that it is possible for the first time, with the microelectrode, to perform measurements e.g. of pH or ion-concentration, and to do so on and in the human body, in a simple manner, without any danger, over a long period. The shape and size of the microelectrodes can be selected so as to cope with all measuring problems. In inaccessible places, the measurements can be performed without taking a sample. The microelectrode can be got to all places, e.g. the heart, by catheter. Manufacture is simple, so the electrode is cheap to produce.

The invention will now be explained in greater detail on the basis of an example of its embodiment.

To the front part of a molybdenum wire made into a point by etching, there is applied an approx. 5 to 10 mm length of a mixture of a conductive lacquer and very finely ground bismuth. The other part of the molybdenum wire is coated with an insulating layer. This insertable microelectrode suitable for pH-measurement is stuck into human tissue, and at another site a reference electrode is applied to the skin, so as to take the respective signals from both.

The claims defining the invention are as follows:

1. A microelectrode, preferably for pH-measurement, characterized in that a molybdenum wire of suitable size is provided, on its front end region, with a coating consisting of a mixture of conductive lacquer and a material suitable for the measuring task concerned; and the remaining part of the molybdenum wire is electrically insulated.

2. A microelectrode as claimed in claim 1,

characterized in that, in the case of pH-measurement, the substance added to the mixture is very finely ground bismuth powder.

3. A microelectrode as claimed in claim 1, characterized in that, in the case of ion-concentration measurement, the substance added to the mixture is an ion-sensitive substance.

4. A microelectrode as claimed in claims 1 to 3, characterized in that the coated part of the wire is pointed.

5. A microelectrode as claimed in claims 1 to 4, characterized in that the molybdenum wire is replaced by a plastic wire which—to lead off the electric signal—is provided with a conductive strip or with a conductive layer covered with an insulating layer.

6. A microelectrode as claimed in claims 1 to 4, characterized in that: to the insulating layer there is applied a conductive silver layer—which in turn is insulated on the surface—to serve as a reference electrode.